

ATTACHMENT TO BWP IW 39

Fishery Products International
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Danvers, Massachusetts

WASTEWATER TREATMENT PROCESS DESCRIPTION

Transmittal No. X002536

WASTEWATER GENERATION

Fishery Products International (FPI) operates a seafood processing facility in Danvers, Massachusetts. Approximately 65,000 to 70,000 gallons per day of treated wastewater is discharged to the South Essex Sewerage District (SESD). The wastewater pretreatment system is operational Monday through Friday, three shifts per day and during one shift on Saturday. Production occurs during the first and second shifts, Monday through Friday. Most notably, significant cleaning operations occur on third shift at night (Monday through Friday) and Saturday, resulting in the generation of a significant portion of the process wastewater volume. The individual sources of wastewater include:

- Equipment washing and sanitizing;
- Floor washing;
- Deglazing water;
- Thaw tank overflow;
- Fryer degreasing and washing (caustic soap followed by vinegar neutralization);
- Cooling water; and
- Boiler blowdown.

Sanitary wastewater generated from 342 employees is segregated from process wastewater and discharged directly to the SESD sanitary sewer.

The process wastewater characteristics include: variable flow rate; high oil and grease, biological oxygen demand (BOD), and total suspended solids (TSS). The pH of the wastewater is variable; ranging from 4 to 11 Standard Units.

TREATMENT SYSTEM DESCRIPTION

The treatment objectives are to normalize wastewater flows; remove coarse solids; reduce BOD, TSS, oil and grease; and adjust pH to the neutral range. The major unit processes include:

- Debris screening;
- Coarse solids removal;
- Flow equalization;
- Three-stage mixing including pH adjustment, conditioning, and flocculation;
- Primary dissolved air flotation (DAF);
- Biological treatment;
- Secondary DAF;
- Sludge thickening;
- Sludge/Screenings collection;
- Flow measurement: and
- Continuous pH monitoring.

The original system designed and permitted by Anderson-Nichols was installed in 1996. In 2004, the system was upgraded by MGK Associates consisting of a new, replacement 45,000-gallon flow equalization tank and replacement of the fixed film trickling filter and clarifiers with a fluidized-bed bioreactor and a secondary DAF system.

All process wastewater from the production floor is conveyed by gravity to Tank 1, a 3,000 gallon capacity, 2-chamber baffled influent collection tank with a sloping bottom. Influent wastewater is pumped by a single transfer pump from Chamber A to the Hycor Rotostrainer for coarse solids removal. Screened wastewater is then directed back to Chamber B. Two, transfer pumps convey wastewater from Chamber B to a 45,000-gallon-capacity fiberglass reinforced plastic (FRP) equalization tank. Aeration is provided to the equalization tank by a single, 50 HP rotary air blower. Wastewater from the equalization tank is pumped at a relatively constant flow rate using variable frequency drives to a 3-stage mixing system (1,800-gallon capacity). Chemical addition consists of acid (sulfuric acid) and caustic (sodium hydroxide) for pH adjustment which is added to the Stage 1 and Stage 2 mix tanks. An electronic pH

meter/controller automatically adjusts chemical feed rates to attain the desired pH set point. A coagulant aid (organic coagulant polymer supplied by Ashland Chemical) followed by a flocculant (a cationic polymer supplied by Ashland Chemical) are added into the Stage 3 mix tank. A 4-20mA flow paced signal automatically adjusts chemical feed rates based on rate of flow measured at the influent weir box. Stages 1 and 2 are equipped with a vertically-mounted mechanical mixer. The third and final stage is equipped with a paddle –type mixer.

Conditioned wastewater is directed to the primary DAF system. Pressurized air is added to separate oils and solids from the liquid fraction. Solids are skimmed from the top of the unit and directed to a 200-gallon-capacity primary DAF skimmings holding tank. Heavier solids are removed from the bottom of the DAF unit and directed to sludge holding/screenings container. Effluent from the DAF units flows to Tank 2; a 5,500-gallon-capacity tank equipped with a continuous reading pH meter. Aeration is provided by a 6.2 HP Siemens rotary air blower. From Tank 2, wastewater is pumped by two submersible pumps to two, 11,000-gallon-capacity fluidized-bed bioreactors (manufactured by Hydroxyl Systems) for soluble BOD removal. Prior to entering the reactors, sodium hydroxide is added as needed to maintain a neutral pH, in addition to a defoamer. Air is supplied to the bioreactors by two, 20 HP rotary air blowers that alternate every 24 hours. Treated wastewater from the bioreactors is directed to a secondary DAF system for biomass removal. DAF solids are skimmed and transferred to the sludge/screenings holding container using a single pump. The treated effluent flows through a Palmer-Bowlus flume for flow measurement, and pH monitoring is performed just upstream of this location, prior to entering the SESD sanitary sewer system.

Thickened sludge in the 200-gallon-capacity tank is directed to two, 1,600-gallon storage tanks equipped with vertically-mounted paddle-type mixers. The sludge is then directed to the sludge/screenings holding container where it is periodically removed by a tanker truck. The oily organic sludge is processed at a local rendering facility.

Performance-based monitoring data from the previous three years indicate that the average effluent quality is as follows:

- BOD – 165 milligrams per liter (mg/L);
- TSS – 200 mg/L; and
- Oil and grease –20 mg/L.

DESIGN CRITERIA AND EQUIPMENT LIST

The following information represents the design criteria for major pretreatment system components. Refer to the attached **Process Flow Diagram** for additional information.

Influent Collection Tank	3,000-gallon capacity, 16 ft x 7 ft x 5 ft working depth with sloping bottom and dividing wall baffle
Tank #1A Feed Pump (Gorman Rupp-Model T4A3S-B)	One, transfer pump (250 gpm)
Rototrainer (Hycor)	49-in. screening drum with 250 gpm through put capacity
Wastewater Transfer Pumps (Gorman Rupp – Model T4A3S-B)	Two, transfer pumps (250 gpm each)
Equalization/Storage Tank (An-Cor Industrial Plastics, Inc)	45,000-gallon-capacity, FRP design at 14 ft dia x 39 ft high
Rotary Air Blowers for Equalization Tank (Kaeser)	One, 50 HP rotary air blower
Process Feed Pumps (Plant Pro)	Two, centrifugal impeller design pumps , 20-60 gpm flow rate with variable frequency drive with in-line basket strainers
Influent Weir Box	4' – 5" x 3' x 2' – 6" depth with 200-gallon capacity and 90° v-notch weir for process feed rate calibration
Chemical Conditioning Tanks	Three tanks with mixers in series; overall size 8' – 4" x 4' – 6" x 8' – 3" high and 1,800-gallon capacity
Primary Dissolved Air Flotation System (Pollution Control In. Model DAF-100)	Clarifier cell 9 ft dia by 8 ft high, 50 gpm reed rate capacity with 35 gpm recycle rate
Tank 2 – Holding Tank	5,500-gallon capacity aerated holding tank 16 ft x 7 ft x 7 ft 6 in deep
Rotary Blower for Tank 2 (Siemens)	One, 6.2 HP rotary air blower
Submersible Pumps (Ebara Model # 50 DWFU61-52)	Two, submersible pumps with in-line basket strainers
pH Controller on Tank 2 Holding Tank (UTeck)	
Ultrasonic Level Sensor (Siemans XRS-5)	
Bioreactors (Hydroxyl Systems)	Two, 11,000-gallon-capacity fluidized bed reactors

DESIGN CRITERIA AND EQUIPMENT LIST

(CONTINUED)

Rotary Air Blowers for Bioreactor (Kaeser)	Two, 20HP rotary air blowers
Secondary Dissolved Air Flotation System (HIS-70)	70 gpm feed rate
Primary DAF Skimmings Collection Tank	200-gallon collection (polyethylene) tank with recirculation mixing
Sludge Transfer Pump for Sludge Thickener (Sandpiper)	Air-operated diaphragm pump
Sludge Holding Tanks	Two, 1,600-gallon capacity FRP tanks with conical bottoms and vertically-mounted paddle –type mixers
Sludge/Screenings Container	Outside rectangular steel liquid container
Screw Conveyer	Stainless steel screw conveyer with gear box and motor

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